CLAIMS

1-15. (Cancelled).

16. (Currently amended) An electrical machine having an output rating (P_x), the electrical machine comprising:

a shaft rotatable about an axis;

a stator including a stator core and windings, the stator core having a fixed cross-sectional profile with respect to the axis; and

a rotor coupled to the shaft and adapted to magnetically interact with the stator, the rotor having a periphery, the rotor being configured to include ~~one~~ three or more axial sections, each of the axial sections having a respective magnetization pattern of alternating magnetic poles skewed with respect to the axis, the magnetization pattern for each of the axial sections being different than any adjacent axial section, the ~~one~~ three or more axial sections ~~define~~ defining a total length (L_x) in the axial direction with respect to the axis,

where (L_x) satisfies the relationship ($0.75\ (P_x/P_m) \leq (L_x/L_m) \leq 1.5\ (P_x/P_m)$),

where (P_m) is a chosen maximum output rating for an electrical machine built with a stator core having the fixed cross-sectional profile,

where (L_m) is the length corresponding to the length of the rotor for the maximum output rating (P_m), ~~and~~

where (P_x) is less than the maximum output rating (P_m), and

where each of the axial sections define an arc of skew (β) at the periphery, (β) being the same for each of the axial sections.

17-19. (Cancelled).

20. (Currently amended) The electrical machine of ~~claim 19~~ claim 16, wherein the axial sections substantially define a herringbone pattern in the axial direction.

21. (Cancelled).

22. (Original) The electrical machine of ~~claim 17~~ claim 16, wherein the lengths of each axial section are approximately the same.

23-45. (Cancelled).

46. (New) An electrical machine comprising:

a shaft rotatable about an axis;

a stator including a stator core and windings;

a rotor coupled to the shaft and adapted to interact with the stator, the rotor including a center cross-section and one or more permanent magnets configured to form at least four axial sections, each of the four axial sections having a magnetization pattern of alternating magnetic poles that are skewed with respect to the axis along substantially straight lines and having an arc of magnetization skew that is substantially the same as the other axial sections, the at least four axial sections including

a first axial section having a first magnetization direction and a first axial length,

a second axial section disposed adjacent to the first axial section, the second axial section having a second magnetization direction, having a second axial length that is substantially the same as the first axial length, and being symmetric to the first axial section with respect to the center cross-section,

a third axial section disposed adjacent to the first axial section, the third axial section having a third magnetization direction that is different than the first magnetization direction and having a third axial length, and

a fourth axial section disposed adjacent to the second axial section, the fourth axial section having a fourth magnetization direction that is different than the third magnetization direction, having a fourth axial length that is substantially the same as the third axial length, and being symmetric to the third axial section with respect to the center cross-section; and

wherein the first, second, third, and fourth magnetization directions define a continuous zig-zag pattern in the axial direction.

47. (New) The electrical machine of claim 46, wherein a ratio range of the sum of the first axial length and the second axial length with the sum of the third axial length and the fourth axial length is between 0.75 and 1.5.

48. (New) The electrical machine of claim 46, wherein the first, second, third, and fourth magnetization directions substantially define a herringbone pattern in the axial direction.

49. (New) The electrical machine of claim 46, wherein the lengths of each axial section are approximately the same.

50. (New) The electrical machine of claim 46, wherein the sum of the first axial length and the second axial length is different than the sum of the third axial length and the fourth axial length.

51. (New) The electrical machine of claim 46, wherein the at least four axial sections include

a fifth axial section disposed adjacent to the third axial section, the fifth axial section having a fifth magnetization direction that is different than the third magnetization direction and having a fifth axial length, and

a sixth axial section disposed adjacent to the fourth axial section, the sixth axial section having a sixth magnetization direction that is different than the fourth magnetization direction, having a sixth axial length that is substantially the same as the fifth axial length, and being symmetric to the fifth axial section with respect to the center cross-section; and

wherein the first, second, third, fourth, fifth, and sixth magnetization directions define a continuous zig-zag pattern in the axial direction.

52. (New) The electrical machine of claim 51, wherein the fifth and sixth axial sections have an arc of magnetization skew that is substantially the same as the arc of magnetization skew of the first, second, third, and fourth axial sections.

53. (New) The electrical machine of claim 46, wherein the first magnetization direction is the same as the third magnetization direction.

54. (New) An electrical machine comprising:

a shaft rotatable about an axis;

a stator including a stator core and windings;

a rotor coupled to the shaft and adapted to interact with the stator, the rotor including a center cross-section and one or more permanent magnets configured to form at least three axial sections, each of the three axial sections having a magnetization pattern of alternating magnetic poles that are skewed with respect to the axis along substantially straight lines and having an arc of magnetization skew that is substantially the same as the other axial sections, the at least three axial sections including

a first axial section having a first magnetization direction and a first axial length, the center cross-section of the first axial section being the same as the center cross-section of the rotor,

a second axial section disposed adjacent to the first axial section, the second axial section having a second magnetization direction that is different than the first magnetization direction and having a second axial length, and

a third axial section disposed adjacent to the first axial section, the third axial section having a third magnetization direction that is different than the first magnetization direction, having a third axial length that is substantially the same as the second axial length, and being symmetric to the second axial section with respect to the center cross-section; and

wherein the first, second, and third magnetization directions define a continuous zig-zag pattern in the axial direction.

55. (New) The electrical machine of claim 54, wherein a ratio range of the first axial length with the sum of the second axial length and the third axial length is between 0.75 and 1.5.

56. (New) The electrical machine of claim 54, wherein the first, second, and third magnetization directions substantially define a herringbone pattern in the axial direction.

57. (New) The electrical machine of claim 54, wherein the first axial length is approximately the same as the sum of the second axial length and the third axial length.

58. (New) The electrical machine of claim 54, wherein first axial length is different than the sum of the second axial length and the third axial length.

59. (New) The electrical machine of claim 54, wherein the at least four axial sections include

a fourth axial section disposed adjacent to the second axial section, the fourth axial section having a fourth magnetization direction that is different than the second magnetization direction and having a fourth axial length, and

a fifth axial section disposed adjacent to the third axial section, the fifth axial section having a fifth magnetization direction different that is than the fifth magnetization direction, having a fifth axial length that is substantially the same as the fourth axial length, and being symmetric to the fourth axial section with respect to the center cross-section; and

wherein the first, second, third, fourth, and fifth magnetization directions define a continuous zig-zag pattern in the axial direction.

60. (New) The electrical machine of claim 59, wherein the fourth and fifth axial sections have an arc of magnetization skew that is substantially the same as the arc of magnetization skew of the first, second, and third axial sections.

61. (New) An apparatus having a family of electrical machines, the apparatus comprising:

a housing;

a first electrical machine disposed in the housing, the first electrical machine comprising

a first shaft rotatable about a first axis,

a first stator including a first stator core and first windings, the first stator core having a cross-sectional profile with respect to the first axis,

a first rotor coupled to the first shaft and adapted to magnetically interact with the first stator, the first rotor including a first center cross-section and a first one or more permanent magnets configured to form two axial sections, each of the two axial sections having a magnetization pattern of alternating magnetic poles that are skewed with respect to the first axis, the two axial sections including

a first axial section having a first magnetization direction and a first axial length,

a second axial section disposed adjacent to the first axial section, the second axial section having a second magnetization direction, having a second axial length that is substantially the same as the first axial length, and being symmetric to the first axial section with respect to the first center cross-section;

a second electrical machine disposed in the housing, the second electrical machine comprising

a second shaft rotatable about a second axis,

a second stator including a second stator core and second windings, the second stator core having the cross-sectional profile with respect to the second axis,

a second rotor coupled to the second shaft and adapted to magnetically interact with the second stator, the second rotor including a second center cross-section and a second one or more permanent magnets configured to form four axial sections, each of the four axial sections having a respective magnetization pattern of alternating magnetic poles that are skewed with respect to the second axis, the four axial sections including

a third axial section having the first magnetization direction and the first axial length,

a fourth axial section disposed adjacent to the third axial section, the fourth axial section having the second magnetization direction, having the second axial length, and being symmetric to the third axial section with respect to the second center cross-section,

a fifth axial section disposed adjacent to the third axial section, the fifth axial section having a third magnetization direction that is different than the first magnetization direction and having a third axial length, and

a sixth axial section disposed adjacent to the fourth axial section, the sixth axial section having a fourth magnetization direction that is different than the second magnetization direction, having a fourth axial length that is substantially the same as the third axial length, and being symmetric to the fifth axial section with respect to the second center cross-section;

wherein the first, second, third, and fourth magnetization directions define a continuous zig-zag.

62. (New) The apparatus of claim 61, wherein a ratio range of the sum of the first axial length and the second axial length with the sum of the third axial length and the fourth axial length is between 0.75 and 1.5.

63. (New) The apparatus of claim 61, wherein the first, second, third, and fourth magnetization directions define a continuous herringbone pattern in the axial direction.

64. (New) The apparatus of claim 61, wherein the lengths of each axial section are approximately the same.

65. (New) The apparatus of claim 61, wherein the sum of the first axial length and the second axial length is different than the sum of the third axial length and the fourth axial length.

66. ((New) The apparatus of claim 61, and further comprising:

a third electrical machine disposed in the housing, the third electrical machine comprising

a third shaft rotatable about a third axis,

a third stator including a third stator core and third windings, the third stator core having the cross-sectional profile with respect to the third axis,

a third rotor coupled to the third shaft and adapted to magnetically interact with the third stator, the third rotor including a third center cross-section and a third one or more permanent magnets configured to form six axial sections, each of the six axial sections having a respective magnetization pattern of alternating magnetic poles that are skewed with respect to the third axis, the six axial sections including

a seventh axial section having the first magnetization direction and the first axial length,

an eighth axial section disposed adjacent to the seventh axial section, the eighth axial section having the second magnetization direction, having the second axial length, and being symmetric to the seventh axial section with respect to the third center cross-section,

a ninth axial section disposed adjacent to the seventh axial section, the ninth axial section having the third magnetization direction and the third axial length, and

a tenth axial section disposed adjacent to the eighth axial section, the tenth axial section having the fourth magnetization direction, having the fourth axial length, and being symmetric to the ninth axial section with respect to the second center cross-section;

an eleventh axial section disposed adjacent to the ninth axial section, the eleventh axial section having a fifth magnetization direction that is different than the third magnetization direction and having a fifth axial length, and

a twelfth axial section disposed adjacent to the tenth axial section, the twelfth axial section having a sixth magnetization direction that is different than the fourth magnetization direction, having a sixth axial length that is substantially the same as the fifth axial length, and being symmetric to the eleventh axial section with respect to the third center cross-section; and

wherein the first, second, third, fourth, fifth, and sixth magnetization directions define a continuous zig-zag.

67. (New) The apparatus of claim 61, wherein the fifth and sixth axial sections have an arc of magnetization skew that is substantially the same as the arc of magnetization skew of the first, second, third, and fourth axial sections.

68. (New) An apparatus having a family of electrical machines, the apparatus comprising:

a housing;

a first electrical machine disposed in the housing, the first electrical machine comprising

a first shaft rotatable about a first axis,

a first stator including a first stator core and first windings, the first stator core having a cross-sectional profile with respect to the first axis,

a first rotor coupled to the first shaft and adapted to magnetically interact with the first stator, the first rotor including a first center cross-section and a first one or more permanent magnets configured to form one axial section, the first axial section having a magnetization pattern of alternating magnetic poles that are skewed with respect to the first axis and a first axial length, the center cross-section of the first axial section being the same as the center cross-section of the first rotor;

a second electrical machine disposed in the housing, the second electrical machine comprising

a second shaft rotatable about a second axis,

a second stator including a second stator core and second windings, the second stator core having the cross-sectional profile with respect to the second axis,

a second rotor coupled to the second shaft and adapted to magnetically interact with the second stator, the second rotor including a second center cross-section and a second one or more permanent magnets configured to form three axial sections, each of the three axial sections having a respective magnetization pattern of alternating magnetic poles that are skewed with respect to the second axis, the three axial sections including

a second axial section having the first magnetization direction and the first axial length, the center cross-section of the second axial section being the same as the second center cross-section of the second rotor,

a third axial section disposed adjacent to the second axial section, the third axial section having a second magnetization direction that is different than the first magnetization direction and having a second axial length, and

a fourth axial section disposed adjacent to the second axial section, the fourth axial section having a third magnetization direction that is different than the first magnetization direction, having a third axial length that is substantially the same as the second

axial length, and being symmetric to the third axial section with respect to the second center cross-section; and

wherein the first, second, and third magnetization directions define a continuous zig-zag.

69. (New) The apparatus of claim 68, wherein a ratio range of the first axial length with the sum of the second axial length and the third axial length is between 0.75 and 1.5.

70. (New) The apparatus of claim 68, wherein the first, second, and third magnetization directions define a continuous herringbone pattern in the axial direction.

71. (New) The apparatus of claim 68, wherein the first axial length is approximately the same as the sum of the second axial length and the third axial length.

72. ((New) The apparatus of claim 68, wherein first axial length is different than the sum of the second axial length and the third axial length.

73. (New) The apparatus of claim 68, and further comprising:

a third electrical machine disposed in the housing, the third electrical machine comprising

a third shaft rotatable about a third axis,

a third stator including a third stator core and third windings, the third stator core having the cross-sectional profile with respect to the third axis,

a third rotor coupled to the third shaft and adapted to magnetically interact with the third stator, the third rotor including a third center cross-section and a third one or more permanent magnets configured to form five axial sections, each of the five axial sections having a magnetization pattern of alternating magnetic poles that are skewed with respect to the third axis, the five axial sections including

a seventh axial section having the first magnetization direction and the first axial length,

an eighth axial section disposed adjacent to the seventh axial section, the eighth axial section having the second magnetization direction, having the second axial length, and being symmetric to the seventh axial section with respect to the third center cross-section,

a ninth axial section disposed adjacent to the seventh axial section, the ninth axial section having the third magnetization direction and the third axial length, and

a tenth axial section disposed adjacent to the eight axial section, the tenth axial section having a fourth magnetization direction that is different than the second magnetization direction, and having a fourth length;

an eleventh axial section disposed adjacent to the ninth axial section, the eleventh axial section having a fifth magnetization direction that is different than the third magnetization direction, having a fifth axial length that is substantially the same as the fourth axial length and being symmetric to the tenth axial section with respect to the third center cross-section; and

wherein the first, second, third, fourth, and fifth magnetization directions define a continuous zig-zag.

74. (New) The apparatus of claim 73, wherein the fourth and fifth axial sections have an arc of magnetization skew that is substantially the same as the arc of magnetization skew of the first, second, and third axial sections.

INTERVIEW SUMMARY

Applicants' representative, Attorney Sheldon L. Wolfe, conducted a telephone interview with Examiner Nguyen on October 14, 2004. The parties discussed the proposed claims submitted on September 28, 2004.

First, the Examiner suggested changing proposed new claim 47 and similar claims to recite a "ratio range" instead of a "ratio." Attorney Wolfe agreed to make the change.

Second, the Examiner suggested that proposed claim 61 may be indefinite as presented. Attorney Wolfe stated that he would review the claim with the Applicants and consider changing the claim, which Applicants did in this response.